IFW

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

PENICAUD ET AL. Atty. Ref.: 5006-9

Serial No. 10/585,094 Group: Unknown

Filed: June 30, 2006 Examiner: Unknown

For: METHOD FOR DISSOLVING CARBON NANOTUBES AND THE USE THEREOF

* * * * * * * * * * * *

April 17, 2007

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1540

Sir:

SUBMISSION

Submitted herewith is a copy of the French Search Report issued in corresponding FR 03/15582 and English translation of the Written Opinion of the International Searching Authority issued in corresponding PCT/FR2004/003383.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: _____

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PATENT COOPERATION TREATY

TRANSLATION

From the INTERNATIONAL SEARCHING AUTHORITY

To:

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	See Form PCT/ISA/210 (sheet 2)
Applicant's or agent's file reference	FOR FURTHER ACTION
CP 61174PCT	See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/FR2004/003383	24.12.2004	30.12.2003

International Patent Classification (IPC) or both national classification and IPC

C01B31/02

Applicant

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE

1. This opinion contains indications relating to the following items:

- ☒ Box No. I — Basis of the opinion
- ☐ Box No. II — Priority
- ☐ Box No. III — Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV — Lack of unity of invention
- ☒ Box No. V — Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI — Certain documents cited
- ☐ Box No. VII — Certain defects in the international application
- ☐ Box No. VIII — Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/EP	Authorized officer
Facsimile No.	Telephone No.

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/FR2004/003383

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This opinion has been established on the basis of a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of international search (under Rule 12.3 and 23.1(b)).

2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

☐ a sequence listing

☐ table(s) related to the sequence listing

b. format of material

☐ in written format

☐ in computer readable form

c. time of filing/furnishing

☐ contained in the international application as filed.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/FR2004/003383

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-15	YES
	Claims		NO
Inventive step (IS)	Claims	1-15	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-15	YES
	Claims		NO

2. Citations and explanations:

Reference is made to the following document:

D1: WO 02/088025 A (NEW YORK UNIVERSITY; SUN YI (US); WILSON STEPHEN (US)) 7 November 2002 (2002-11-07)

1- Comment:

Claim 1, from the way in which it is worded, does not mention a particular solvent and, consequently, is not considered to be based on the description pursuant to PCT Article 6. This is because the description makes reference to the dispersion of carbon nanotubes in a polar solvent (page 2, line 34), suitable polar organic solvents being mentioned on page 3, lines 16-19.

Moreover, dependent claim 5 mentions the following information: "...characterized in that *the polar organic solvents* are..." and makes reference to polar organic solvents that have not been presented beforehand.

The expression "*dissolution of carbon nanotubes*" used in claim 1 introduces a lack of clarity in the

interpretation of this claim.

This is because the process presented in claim 1 may be considered as a process for the *dissolution of nanotube aggregates* or else as a process for the *dispersion of carbon nanotubes* in which, *a priori* the nanotubes retain their integrity.

2- Novelty:

Independent claim 1 proposes a method of dispersing carbon nanotubes in a solvent consisting, firstly, in reducing the nanotubes, resulting in negatively charged nanotubes combined with positive counterions.

No document of the prior art cited mentions such a process.
Consequently, the subject matter of process claim 1 and of its dependent claims 2-12, as well as the subject matter of application claims 13-15, is novel (PCT Article 33(2)).

3- Inventive step:

Document D1 is considered to be the closest prior art to the subject matter of claim 1. D1 mentions the difficulty of dispersing carbon nanotubes in most solvents, the difficulty being due in particular to the fact that they are in the form of aggregates (pages 2 and 3, paragraphs 4 and 5).
D1 reports that carbon nanotubes, treated by being dispersed in an electron donor compound, such as an

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

aromatic amine, then become dispersible in polar or non-polar organic solvents (pages 4 and 5, paragraphs 16 and 17). The reaction mechanism that occurs between the carbon nanotubes and an aromatic amine is proposed in D1, paragraph 39.

The difference between claim 1 of the present invention and D1 is that, in the present application, the method involves negatively charged nanotubes combined with positive counterions, whereas, in D1, the method uses a compound that acts as dispersion agent which in fact seems to form a complex with the carbon nanotubes (see D1, page 4, paragraph 10 and page 15, paragraph 39).

This difference leads to a method of dispersing carbon nanotubes that makes it possible to preserve their integrity and their properties.

The problem to be solved is therefore to propose an alternative method of dispersion that respects the carbon nanotubes.

D1, considered by itself or in combination with another document of the cited prior art, does not provide information which would allow a person skilled in the art to modify the method of D1 in order to arrive at a method according to claim 1 of the present application.

The subject matter of claim 1 does not follow in an obvious manner from the prior art.

Consequently, the subject matter of claim 1 and of its

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

dependent claims 2-12, and also the subject matter of claims 13-15, is considered to involve an inventive step.

RÉPUBLIQUE FRANÇAISE

INPI
INSTITUT NATIONAL DE LA PROPRIETE INDUSTRIELLE

RAPPORT DE RECHERCHE PRÉLIMINAIRE

établi sur la base des dernières revendications déposées avant le commencement de la recherche

N° d'enregistrement national
FA 646938
FR 0315582

DOCUMENTS CONSIDÉRÉS COMME PERTINENTS		Revendication(s) concernée(s)	Classement attribué à l'invention par l'INPI
Catégorie	Citation du document avec indication, en cas de besoin, des parties pertinentes		
A	WO 02/088025 A (NEW YORK UNIVERSITY; SUN YI (US); WILSON STEPHEN (US)) 7 novembre 2002 (2002-11-07) * alinéa '0002! * * alinéas '0015! - '0017! * * alinéa '0021! * * alinéa '0030! *	1,4,5, 7-10, 13-15	B01F1/00 C01B31/02 B82B3/00
A	FENG WEI ET AL: "Fabrication of composite films by controlling molecular doping processes between polyaniline and soluble multiwalled nanotubes and their optical characteristics" JPN J APPL PHYS PART 1 REGUL PAP SHORT NOTE REV PAP; JAPANESE JOURNAL OF APPLIED PHYSICS, PART 1: REGULAR PAPERS AND SHORT NOTES AND REVIEW PAPERS SEPTEMBER 2003, vol. 42, no. 9 A, septembre 2003 (2003-09), pages 5726-5730, XP001185692 * le document en entier *		DOMAINES TECHNIQUES RECHERCHÉS (Int.Cl.7)
A	US 6 187 823 B1 (CHEN JIAN ET AL) 13 février 2001 (2001-02-13)		C01B
A	QIAO R ET AL: "Atypical dependence of electroosmotic transport on surface charge in a single-wall carbon nanotube" NANO LETTERS,AMERICAN CHEM. SOC, USA, vol. 3, no. 8, août 2003 (2003-08), pages 1013-1017, XP002292244 ISSN: 1530-6984 * le document en entier *		

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Date d'achèvement de la recherche: 25 août 2004

Examinateur: Rigondaud, B

CATÉGORIE DES DOCUMENTS CITÉS

X : particulièrement pertinent à lui seul
Y : particulièrement pertinent en combinaison avec un autre document de la même catégorie
A : arrière-plan technologique
O : divulgation non-écrite
P : document intercalaire

T : théorie ou principe à la base de l'invention
E : document de brevet bénéficiant d'une date antérieure à la date de dépôt et qui n'a été publié qu'à cette date de dépôt ou qu'à une date postérieure.
D : cité dans la demande
L : cité pour d'autres raisons

& : membre de la même famille, document correspondant

EPO FORM 1503 12.99 (P04C14)

ANNEXE AU RAPPORT DE RECHERCHE PRÉLIMINAIRE RELATIF A LA DEMANDE DE BREVET FRANÇAIS NO. FR 0315582 FA 646938

La présente annexe indique les membres de la famille de brevets relatifs aux documents brevets cités dans le rapport de recherche préliminaire visé ci-dessus.
Les dits membres sont contenus au fichier informatique de l'Office européen des brevets à la date du 25-08-2004
Les renseignements fournis sont donnés à titre indicatif et n'engagent pas la responsabilité de l'Office européen des brevets, ni de l'Administration française

Document brevet cité au rapport de recherche	Date de publication	Membre(s) de la famille de brevet(s)	Date de publication
WO 02088025 A	07-11-2002	WO 02088025 A1	07-11-2002
		US 2003001141 A1	02-01-2003
US 6187823 B1	13-02-2001	US 2001016608 A1	23-08-2001
		US 6331262 B1	18-12-2001
		US 6368569 B1	09-04-2002
		US 2001010809 A1	02-08-2001

EPO FORM P0465